



New species and records of *Cheiromyia* Dyte from Brazil and French Guiana (Diptera: Dolichopodidae)

SCOTT E. BROOKS¹, JEFFREY M. CUMMING¹, FRANCISCO LIMEIRA-DE-OLIVEIRA² & MARC POLLET³

¹Diptera Unit, Canadian National Collection of Insects, Invertebrate Biodiversity, Agriculture and Agri-Food Canada, K.W. Neatby Building, 960 Carling Avenue, Ottawa, Ontario, K1A 0C6, CANADA. E-mail: Scott.Brooks@agr.gc.ca; Jeff.Cumming@agr.gc.ca

²Universidade Estadual do Maranhão, Centro de Estudos Superiores de Caxias, Laboratório de Estudos dos Invertebrados, 65604–380, Caxias, Maranhão, BRAZIL. E-mail: limeiraf@gmail.com

³Research Team Species Diversity (SPECDIV), Research Institute for Nature and Forest (INBO), Kliniekstraat 25, B-1070 Brussels, BELGIUM; Research Group Terrestrial Ecology (TEREC), University of Ghent (Ugent), K.L.Ledeganckstraat 35, B-9000 Ghent, BELGIUM; and Department of Entomology, Royal Belgian Institute of Natural Sciences (RBINS), Vautierstraat 29, B-1000 Brussels, BELGIUM. E-mail: mpollet.doli@gmail.com

Abstract

Cheiromyia carolina Limeira-de-Oliveira & Brooks **sp. nov.** and *C. nordestina* Limeira-de-Oliveira & Cumming **sp. nov.** are described from Brazil, and *C. fuscipennis* Pollet & Brooks **sp. nov.** is described from the Mitaraka Mountains in south-western French Guiana. New distribution records are reported for *C. brevitarsis* Brooks, *C. palmaticornis* (Parent) and *C. pennaticornis* (Parent), and a revised key to males of the eight known species of *Cheiromyia* Dyte, 1980 is provided. The female of *C. pennaticornis* is also described for the first time.

Key words: Empidoidea, Dolichopodidae, *Cheiromyia*, Neotropical, Brazil, French Guiana, new species, key

Introduction

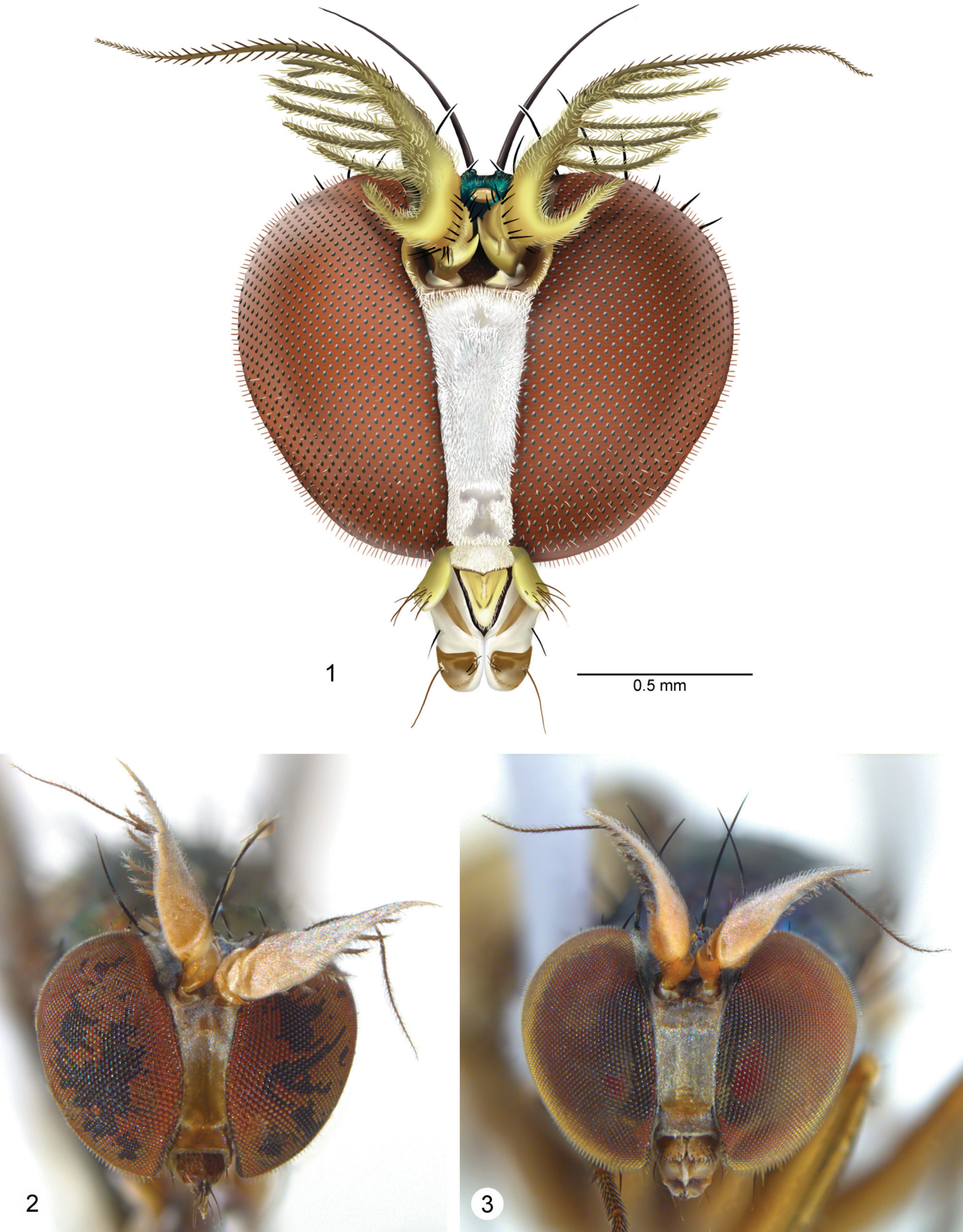
The genus *Cheiromyia* Dyte, 1980 is a group of Neotropical Dolichopodinae known to occur from Costa Rica south to Bolivia and the Brazilian Atlantic Forest. Males of the genus are readily distinguished by their striking antler-like antennae (Fig. 1), which possess one or many narrow projections on the outer surface of the enlarged postpedicel. Brooks *et al.* (2010) revised *Cheiromyia* and recognized five species: *C. bicornis* Brooks, *C. brevitarsis* Brooks, *C. laselva* Brooks, *C. palmaticornis* (Parent) and *C. pennaticornis* (Parent). Since then, collecting efforts in northern Brazil and in the Mitaraka Mountains of southwestern French Guiana (Pascal *et al.* 2015; Pollet *et al.* 2015) along with newly discovered museum holdings, have yielded additional specimens of *C. brevitarsis*, *C. palmaticornis* and *C. pennaticornis* (including the first-known females of the latter), as well as material of three undescribed species. The purpose of this study is to describe the new species, record the new distributional data for *C. brevitarsis*, *C. palmaticornis* and *C. pennaticornis* (with description of the female of the latter), and update the key presented in Brooks *et al.* (2010) to include the three additional new species.

Material and methods

Specimens examined in this study are deposited in the Canadian National Collection of Insects, Ottawa, Canada (CNC), the Coleção Zoológica do Maranhão, Caxias, Brazil (CZMA), the Instituto Federal do Triângulo Mineiro, Uberaba, Brazil (IFTM), the Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil (INPA), the Muséum national d'Histoire naturelle, Paris, France (MNHN), and the Marc Pollet Collection, Welle, Belgium (MAPC).

Primary type label data are cited verbatim and are listed from the top label downward, with data from each

label placed in quotation marks and separated from data on other labels by a semicolon. Lines on labels are delimited by a vertical line (|) with additional information included in square brackets, *i.e.*, []. Label codes used for specimens from Mitaraka, French Guiana are defined in Pollet *et al.* (2018).



FIGURES 1–3. Heads of male *Cheiromyia* in anterior view. **1.** *Cheiromyia brevitarsis* Brooks. **2.** *Cheiromyia carolina* Limeira-de-Oliveira & Brooks **sp. nov.** **3.** *Cheiromyia nordestina* Limeira-de-Oliveira & Cumming **sp. nov.**

Morphological terms and male genitalic homologies follow Cumming & Wood (2017) and Brooks *et al.* (2010). Macrotrichia are referred to as bristles, setae, setulae and hairs depending on relative decreasing size.

Male terminalia dissections were macerated in 85% lactic acid heated in a microwave oven for multiple 20–30 second intervals until muscle tissue dissolved. Following examination each dissection was transferred to a microvial with glycerin and attached to the pin of the associated specimen. Figures showing male hypopygia in lateral view are oriented as they appear on the intact specimen (rotated 180° and lateroflexed to the right) with the morphologically ventral surface of the hypopygium facing up, dorsal surface down, anterior end facing right and posterior end facing left.

Genus *Cheiromyia* Dyte

Cheirocerus Parent, 1930: 13. Type species: *Cheirocerus palmaticornis* Parent [Neotropical], by monotypy. Preoccupied by *Cheirocerus* Eigenmann, 1917 [Pisces].

Cheiromyia Dyte, 1980: 223. Type species: *Cheirocerus palmaticornis* Parent, automatic. Replacement name for *Cheirocerus* Parent, 1930.

Recognition. Males of the genus are readily distinguished by their striking antler-like antennae (Figs 1–8), each bearing one or many projections on the outer surface of the enlarged postpedicel (Figs 1, 4, 6), and by their distinctive hypopygia with ventrally projecting right and left apicoventral epandrial lobes, each bearing a pair of long fine setae (Figs 17, 19, 22, 24). Females are problematic to recognize when not collected with males, and cannot readily be diagnosed from females of *Paraclius* Loew. Morphological features shared among all species are given in the full generic redescription provided by Brooks *et al.* (2010) and are not included in the species descriptions below.

Distribution. Based on the material examined in the revision by Brooks *et al.* (2010) and new records reported herein, the genus is known to occur from the following countries: Costa Rica, Colombia, Ecuador, Brazil (Acre, Amapá, Amazonas, Ceará, Pará, Piauí, Pernambuco, Maranhão, Minas Gerais, Roraima, São Paulo, Sergipe, Tocantins), Bolivia (La Paz), Guyana, Surinam and French Guiana. Currently the genus has not been recorded from southern South America or from the Pacific side of the Andes Mountains.

Key to species of *Cheiromyia* (males)

- 1 Postpedicel with one elongate projection on outer surface (Brooks *et al.* 2010, fig. 1A); antenna entirely dark brown; face dark brown and narrow; femora infusate (Brazil: Amazonas) *C. bicornis* Brooks
- Postpedicel with several projections on outer surface (Figs 1–4, 6, 8); antenna with scape and pedicel pale, postpedicel entirely dark brown, or pale basally; face silvery white or opaque yellow, width various (Figs 1–3; Brooks *et al.* 2010, figs 2A–C); at least fore and hind femora mostly pale (fore femur of *C. nordestina* Limeira-de-Oliveira & Cumming **sp. nov.** infusate anteroventrally at mid length) 2
- 2 Postpedicel elongate subtriangular, gradually tapering to apex (Figs 4–7), outer surface with 5–11 projections 3
- Postpedicel subovoid basally with abruptly narrowed digitiform apex, outer surface with 3–5 projections (Fig. 8; Brooks *et al.* 2010, fig. 1B) 5
- 3 Postpedicel with short, stubby projections (Fig. 6); fore femur with anterior surface pale yellow, lacking denser setulae anteroventrally (Fig. 12); cercus mainly pale on ventral (inner) surface with only posterior and lateral margin infusate (Fig. 20) (Brazil: Ceará, Maranhão, Piauí and São Paulo) *C. nordestina* Limeira-de-Oliveira & Cumming **sp. nov.**
- Postpedicel with long projections (Figs 4; Brooks *et al.* 2010, fig. 1D); fore femur with anterior surface bright yellow-orange, with denser setulae anteroventrally (Figs 11, 13, 14); cercus more extensively infusate on ventral (inner) surface (Figs 15, 23) 4
- 4 Fore femur with infusate area anteroventrally at mid length, with associated crest of dense elongated setulae below infusate area (Fig. 11); mid femur brown on anterior and posterior surfaces; postpedicel with 6–7 projections (Fig. 4); face relatively narrow (Fig. 2); apicoventral epandrial lobe short and subtriangular (Fig. 17); hypandrium asymmetrical (Fig. 16); smaller species, wing length about 4.2 mm (Brazil: Maranhão). *C. carolina* Limeira-de-Oliveira & Brooks **sp. nov.**
- Fore femur without infusate area anteroventrally, with denser setulae running along most of anteroventral edge (Figs 13, 14); mid femur pale; postpedicel with 9–11 projections (Brooks *et al.* 2010, fig. 1D); face broad (Brooks *et al.* 2010, fig. 2A); apicoventral epandrial lobe elongate and curved (Fig. 24); hypandrium more or less symmetrical; larger species, wing length 4.8–5.1 mm (Brooks *et al.* 2010, fig. 7) (Bolivia, Brazil, French Guiana) *C. pennaticornis* (Parent)
- 5 Fore leg with tarsomere 2 slightly longer than tarsomere 3; cercus large and triangular with series of long, strong setae along

- posterior margin (Brooks *et al.* 2010, fig. 6A); face narrow (Brooks *et al.* 2010, fig. 2C) (Ecuador, Brazil, Surinam, French Guiana) *C. palmaticornis* (Parent)
- Fore leg with tarsomere 2 shorter than tarsomere 3 (Brooks *et al.* 2010, fig. 4A); cercus ovoid or subquadrate, with relatively short marginal setae (Fig. 19); face wider (as in Fig. 1) 6
- 6 Wing infusate (Fig. 10); postpedicel dark brown (Fig. 8); fore tibia not swollen; hypandrium with preapical hook-like process on each side (Fig. 18) (French Guiana) *C. fuscipennis* Pollet & Brooks **sp. nov.**
- Wing hyaline (Brooks *et al.* 2010, fig. 2D); postpedicel pale basally (especially on medial surface, Fig. 1); fore tibia slightly swollen (Brooks *et al.* 2010, fig. 4A); hypandrium without preapical hook-like process on each side (Brooks *et al.* 2010, figs 4C, 5C) 7
- 7 Left apicoventral epandrial lobe lacking acute apicodorsal projection (Brooks *et al.* 2010, fig. 4B); face relatively narrow (Fig. 1) (Colombia, Guyana, French Guiana, Brazil) *C. brevitaris* Brooks
- Left apicoventral epandrial lobe with acute apicodorsal projection (Brooks *et al.* 2010, fig. 5A); face wider (Costa Rica) *C. laselva* Brooks

Descriptions of new species

Cheiromyia carolina Limeira-de-Oliveira & Brooks **sp. nov.**

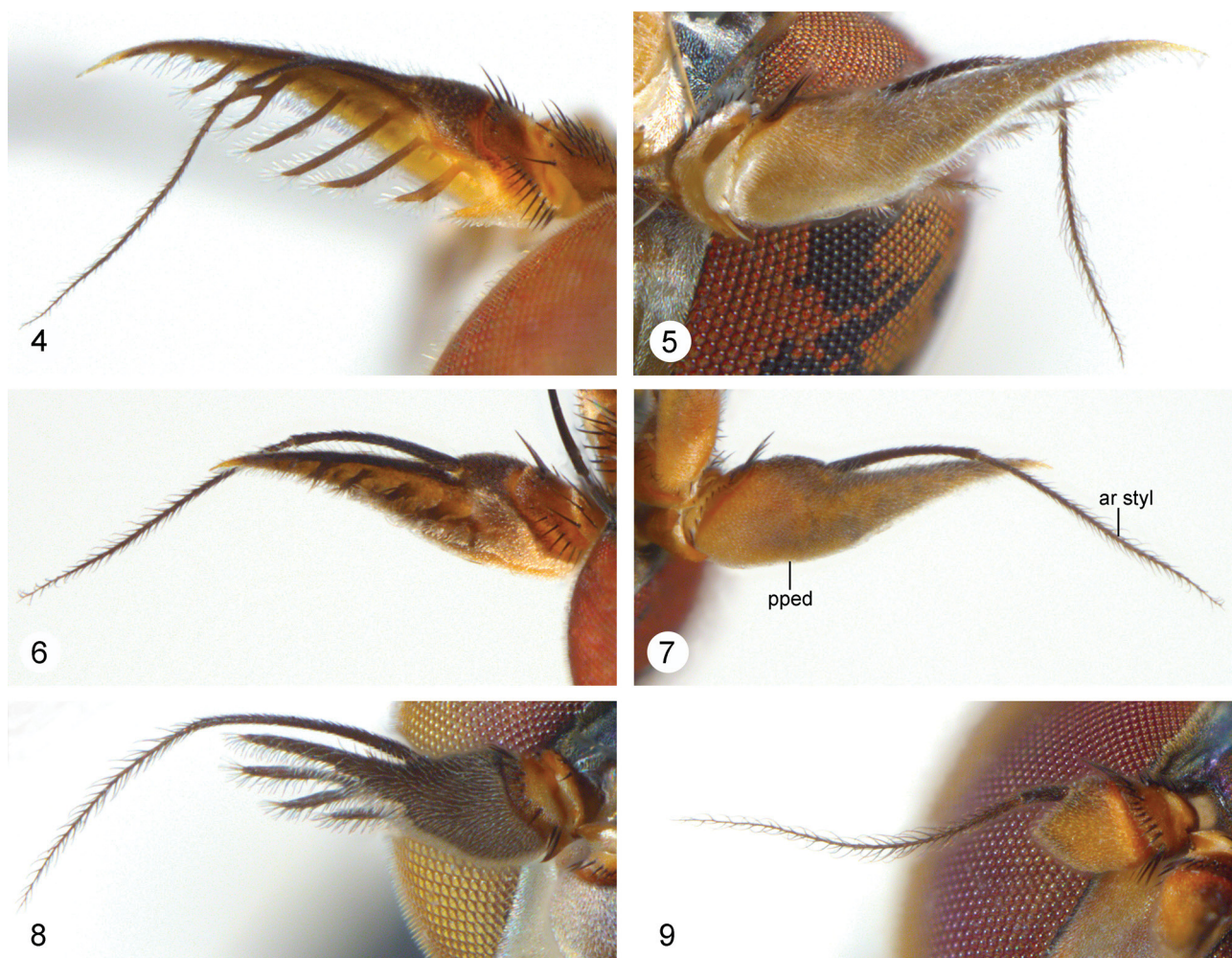
(Figs 2, 4, 5, 11, 15–17, 28)

Type material. HOLOTYPE: ♂, from Parque Nacional Chapada das Mesas, Brazil (Maranhão), labelled: “CZMA| Brasil (MA), Carolina| PARNA Chapada das Mesas,| Fazenda Cincorá, 210 m| 07°22′48.8″S/ 47°14′32.0″W”; “CZMA| Varredura| 11–14.vi.2013, J.A. Rafael,| F. Limeira-de-Oliveira &| AA. Santos, cols.”; “HOLOTYPE| *Cheiromyia carolina*| Limeira-de-Oliveira & Brooks” [red label] (CZMA). **PARATYPES: BRAZIL: Maranhão:** same data as holotype (1♂, CNC); same data except, Riacho Cancela, 225 m, 07°06′44″S, 47°17′57″W, Malaise, 1–10.viii.2013, J.A. Rafael, F. Limeira-de-Oliveira & T.T.A. Silva (1♂, CNC); same data except, Armadilha Suspensa Lâmina d’água, 20–30.ix.2013 (1♂, CZMA).

Recognition (male). This species can be distinguished based on the following combination of characters: postpedicel about 4.5X as long as wide, elongate subtriangular, gradually tapering to apex, outer surface with 6–7 long projections, pale with projections and dorsal margin infusate (Figs 2, 4, 5); face relatively narrow (Fig. 2); fore femur somewhat laterally compressed with anterior surface bright yellow-orange, with infusate and silvery pruinose area anteroventrally at mid length, with associated crest of dense elongated setulae below infusate area (Fig. 11); apicoventral epandrial lobe short and subtriangular (Fig. 17); hypandrium asymmetrical (Fig. 16); cercus extensively infusate on ventral (inner) surface (Fig. 15).

Description (male). Body length: 6.1 mm, wing length: 4.2 mm. **Head:** Eyes uniformly dull red. Upper-most 5–7 postocular setae black, lower 10–11 white, lower-most 2–3 dark brown. Frons subrectangular (wider than high), dark metallic blue-green with violet reflections, silvery white pruinosity on lateral margins. Face (Fig. 2) opaque yellow-brown with weak silvery white pruinosity on upper part, relatively narrow, narrowest just below middle. Clypeus subrectangular (slightly wider than high), concolorous with face, about 1/4 face height. Palpus brown, ovoid with short black setulae on apical half of outer surface. Proboscis mainly yellowish, anterior surface of each labellar lobe dark brown with close-set row of 2 elongate thickened black setae, with apical third abruptly downturned, each labellar lobe with long thin brown seta preapically and near middle. Antenna (Figs 4, 5) with scape and pedicel pale yellow below and infusate brown dorsally, postpedicel pale basally with dark apicodorsal margin and apex, inner surface with distinct whitish pruinosity; scape obconical, with acute ventral process; pedicel short; postpedicel about 4.5X as long as wide, elongate subtriangular, gradually tapering to apex, outer surface with 6–7 long projections (occasionally bifurcated), arista-like stylus dorsal, well before middle of dorsal margin of postpedicel, basal article elongate but not extending to tip of postpedicel, distal article with long pubescence. **Thorax:** Scutum predominantly metallic green with violet and blue reflections, anterior half with strong bronze reflections, dark bronze patch above notopleuron immediately posterior to suture. Scutellum concolorous with scutum. Mesopleuron gray pruinose with dark brown background coloration and weak metallic green and bluish reflections. **Legs:** Mainly pale yellow with black setae, except as noted below. *Fore leg:* Coxa with anterior surface mainly dark brown with prominent silvery pruinosity, lateral surface mainly pale with infusate and silvery pruinose area at base; femur somewhat laterally compressed with anterior surface bright yellow-orange, with infusate and silvery pruinose area anteroventrally at mid length, with associated crest of dense elongated setulae below infusate area (Fig. 11); tibia not swollen; tarsomeres 3–5 with sparse velvety pile

on ventral surface, claws enlarged (relative to other legs). *Mid leg*: Coxa mainly dark brown with silvery pruinosity, pale apically; femur brown on anterior and posterior surfaces; tarsus infusate from tip of tarsomere 2 onwards. *Hind leg*: Coxa with lateral surface dark brown with silvery pruinosity; tarsus infusate from middle of tarsomere 2 onwards. **Wing**: Weakly tinted brown, M with weak arc beyond bend (similar to Brooks *et al.* 2010, fig. 2E). **Abdomen**: Tergites 1–5 brownish black with weak metallic greenish reflections and silvery pruinosity laterally, tergite 5 pale posteroventrally with weaker pruinosity. *Hypopygium* (Figs 15–17): Epandrium dark brown, with apicoventral portion pale, basiventral epandrial seta present on each side at apical 2/3, right and left basiventral epandrial lobe not developed; apicoventral epandrial lobe relatively short, subtriangular, with dark narrow apex, bearing 2 long pale lateral setae. Surstylus: dorsal arm with sac-like medioventral lobe, with short finger-like dorsal process bearing tiny apical seta, apex slightly expanded with small patch of microtrichia medially; ventral arm with sinuous apical seta, apex rounded, with subapical process present. Postgonite digitiform. Cercus subovoid, pale on dorsal (outer) surface (Fig. 17), extensively infusate on ventral (inner) surface (Fig. 15), with sparse short pale setae dorsally, ventrally and marginally, and one long pale seta apically. Hypandrium (Figs 16, 17) asymmetrical, left side with apical projection bearing well-developed subapical dentiform process, right side with weak subapical process, desclerotized medially. Sperm pump folded back on itself, with simple single fold, opposing surfaces tightly appressed. Phallus with narrow lateral preapical process. Ejaculatory apodeme with ventral curve. **Female**: Unknown.



FIGURES 4–9. Antennae of *Cheiromyia*. **4.** *Cheiromyia carolina* Limeira-de-Oliveira & Brooks **sp. nov.**, male, left antenna, outer surface. **5.** Same, inner surface. **6.** *Cheiromyia nordestina* Limeira-de-Oliveira & Cumming **sp. nov.**, male, left antenna, outer surface. **7.** Same, inner surface. **8.** *Cheiromyia fuscipennis* Pollet & Brooks **sp. nov.**, male holotype, right antenna, inner surface. **9.** *Cheiromyia pennaticornis* (Parent), female, right antenna, inner surface. Abbreviations: ar styl–arista-like stylus; pped–postpedicel.

Distribution. This species is known only from the Brazilian state of Maranhão, where the type series was collected in a gallery forest (Fig. 28) within the Cerrado biome of Chapada das Mesas National Park, along with part of the type series of *C. nordestina* Limeira-de-Oliveira & Cumming **sp. nov.** and specimens of *C. brevitarsis* Brooks.

Etymology. The specific epithet refers to the Maranhão municipality of Carolina, where the type series was collected.

Remarks. This species appears to be closely related to *C. pennaticornis*, with which it shares similar antennal morphology, as well as several additional putative synapomorphies (see “Remarks” under *C. pennaticornis*).

***Cheiromyia fuscipennis* Pollet & Brooks sp. nov.**

(Figs 8, 10, 18, 19, 25)

Type material. HOLOTYPE: ♂, from the Mitaraka Mountains, French Guiana, labelled: “FRENCH GUIANA: Mitaraka,| MIT-A-RBF1, 02°14'11.4"N,| 54°27'07.0"W, 306 m, on veg.| along muddy trail, 3.iii.2015,| SW, Marc Pollet”; “(FR-GU/Mitaraka/2015)| sample code:MITARAKA/050| (sorted by Marc Pollet, 2015)”; “La Planète Revisitée –| MNHN / PNI Guyane| 2015 - APA-973-1”; “HOLOTYPE| *Cheiromyia fuscipennis*| Pollet & Brooks” [red label] (MNHN). **PARATYPES: FRENCH GUIANA:** Mitaraka Mountains: same data as holotype except, MITARAKA/050 (1♀, MNHN); same data as holotype except, MITARAKA/055 (1♀, MAPC); MIT-A-RBF2, 02°14'12.5"N, 54°27'08.1"W, 287 m, on bamboo and banana-like leaves, 27.ii.2015, SW, MITARAKA/019 (1♀, MAPC).

Recognition (male). This species can be distinguished based on the following combination of characters: postpedicel (Fig. 8), about 2.5X as long as wide, subovoid basally with narrow pubescent digitiform apex and 3–4 pubescent digitiform projections on outer surface, entirely dark brown; wing infusate (Fig. 10); fore tibia not swollen, fore tarsus with tarsomere 2 shorter than 3, fore tarsomeres 3–4 lacking distinct row of erect setae on inner margin; hypandrium with preapical hook-like process on each side (Fig. 18). This species is very similar to *C. brevitarsis* and *C. laselva*, but can be distinguished by its infusate wing, dark brown postpedicel and distinctive hypandrium.

Description. Male: Body length: 4.6 mm, wing length: 5.0 mm. **Head:** Eyes uniformly dull red. Upper-most 6–7 postocular setae black, lower 9 setae whitish yellow and lower-most 3 dark brown. Frons subrectangular (wider than high), dark metallic blue-green with violet reflections, lower 2/3 silvery pruinose. Face silvery white, relatively broad, (similar to *C. brevitarsis*, see Fig. 1), narrowest at middle. Clypeus subrectangular (slightly wider than high), concolorous with face, 1/4 face height. Palpus pale, ovoid with short black setulae on apical half of outer surface. Proboscis brownish yellow, anterior surface of each labellar lobe with close-set row of 3 elongate, slightly flattened, brown setae with hook-like apical bend, lateral surface of each labellar lobe with long thin brown seta near middle. Antenna (Fig. 8) with scape and pedicel reddish-yellow, scape slightly infusate dorsally, postpedicel dark brown, with distinct greyish pruinosity, especially on medial surface; scape obconical, with acute medial and ventral processes; pedicel short; postpedicel about 2.5X as long as wide, subovoid basally with narrow digitiform pubescent apex, outer surface with 3–4 pubescent digitiform projections (1 bifurcate projection on right antenna of holotype), with basal-most projection shorter and stouter; arista-like stylus mid-dorsal, entirely black, 1.5X as long as postpedicel, basal article elongate (0.7X as long as apical article), reaching slightly beyond tip of postpedicel, distal article with long pubescence. **Thorax:** Scutum metallic green with violet and bronze reflections, dark bronze patch above notopleuron immediately posterior to suture. Scutellum concolorous with scutum. Mesopleuron gray pruinose with dark brown background coloration and weak metallic green to bluish reflections. **Legs:** Pale yellow with black setae, except as noted below. *Fore leg:* Coxa with weak silvery pruinosity, with weak brownish markings basally and on anterior surface; femur without dense setulae on anterovental margin (similar to Fig. 12); tibia not swollen; tarsus with pronounced outward bend, tarsomere 1 about equal to tarsomeres 3–4 combined, tarsomere 2 shorter than tarsomere 3, tarsomeres 3–4 lacking distinct row of erect setae on inner margin, tarsomeres 3–5 with sparse velvety pile on ventral surface, claws enlarged and stout (relative to other legs), crossed in holotype. *Mid leg:* Coxa with lateral surface and outer margin of anterior surface dark with silvery pruinosity; tarsus weakly infusate from tip of tarsomere 1. *Hind leg:* Coxa with lateral surface brownish with silvery pruinosity; tarsus weakly infusate from tip of tarsomere 1. **Wing:** Distinctly evenly infusate (Fig. 10); M with weak arc beyond bend. **Abdomen:** Tergites 1–5 brownish black with weak metallic greenish reflections and silvery

pruinosity laterally. *Hypopygium* (Figs 18, 19): Epandrium dark brown, with apicoventral 1/3 pale; basiventral epandrial seta present on each side at apical 2/3, left basiventral epandrial lobe acutely pointed, right basiventral epandrial lobe weakly developed, short with truncate apex; apicoventral epandrial lobe moderately-sized, projecting ventrally, with dark claw-like dorsal (outer) lobe bearing 2 long pale lateral setae and rounded membraneous ventral (inner) lobe (left and right apicoventral epandrial lobes largely symmetrical). Surstylus: dorsal arm with small medioventral lobe, with short finger-like dorsal process bearing tiny apical seta, apex slightly expanded with microtrichia medioventrally; ventral arm with stout curved apical seta, apex rounded, with subapical crest present. Postgonite digitiform. Cercus subovoid, mainly pale with narrow dark outer margin, with sparse short pale setae dorsally, and short erect dark setae along posterior margin, with one longer pale seta apically. Hypandrium (Fig. 18) deeply divided medially into pair of lateral lobes, each bearing sclerotized dentiform process. Sperm pump folded back on itself, with simple single fold, opposing surfaces tightly appressed. Phallus widened preapically with large flap-like lateral process, apex narrow. Ejaculatory apodeme with ventral curve. **Female:** Body length: 5.5 mm, wing length: 5.0 mm. Similar to male except as follows: Face and clypeus broader, face parallel-sided. Palpus with 1 strong apical seta. Proboscis lacking close-set row of 3 elongate setae on anterior surface of each labellar lobe. Antenna unmodified (similar to Fig. 9), postpedicel lacking projections, small, about as long as wide, rounded triangular with acute apex, mainly dark brown with basal margin pale; arista-like stylus straight, 3X as long as first three antennal segments combined, inserted just beyond middle on dorsal margin, basal article short, 1/6X as long as apical article. Fore leg with tarsomere 2 as long as tarsomere 3. Terminalia with tergite 10 brown, divided medially into hemitergites each bearing 5 dark brown, blunt and apically flattened spines.

Distribution. *Cheiromyia fuscipennis* Pollet & Brooks **sp. nov.** is known from the Mitaraka Mountains in southwestern French Guiana, where the type series was collected by sweep netting (Pollet *et al.*, 2018) in non-flooded palm swamps along the Alama River (Fig. 25).

Etymology. The species name refers to the dark wings in this species, “*fuscus*” meaning dark, and “*penna*” meaning wing.

Remarks. This species seems closely related to *C. brevitaris* and *C. laselva* based on the modified male fore tarsus with tarsomere 2 shorter than 3.

***Cheiromyia nordestina* Limeira-de-Oliveira & Cumming sp. nov.**

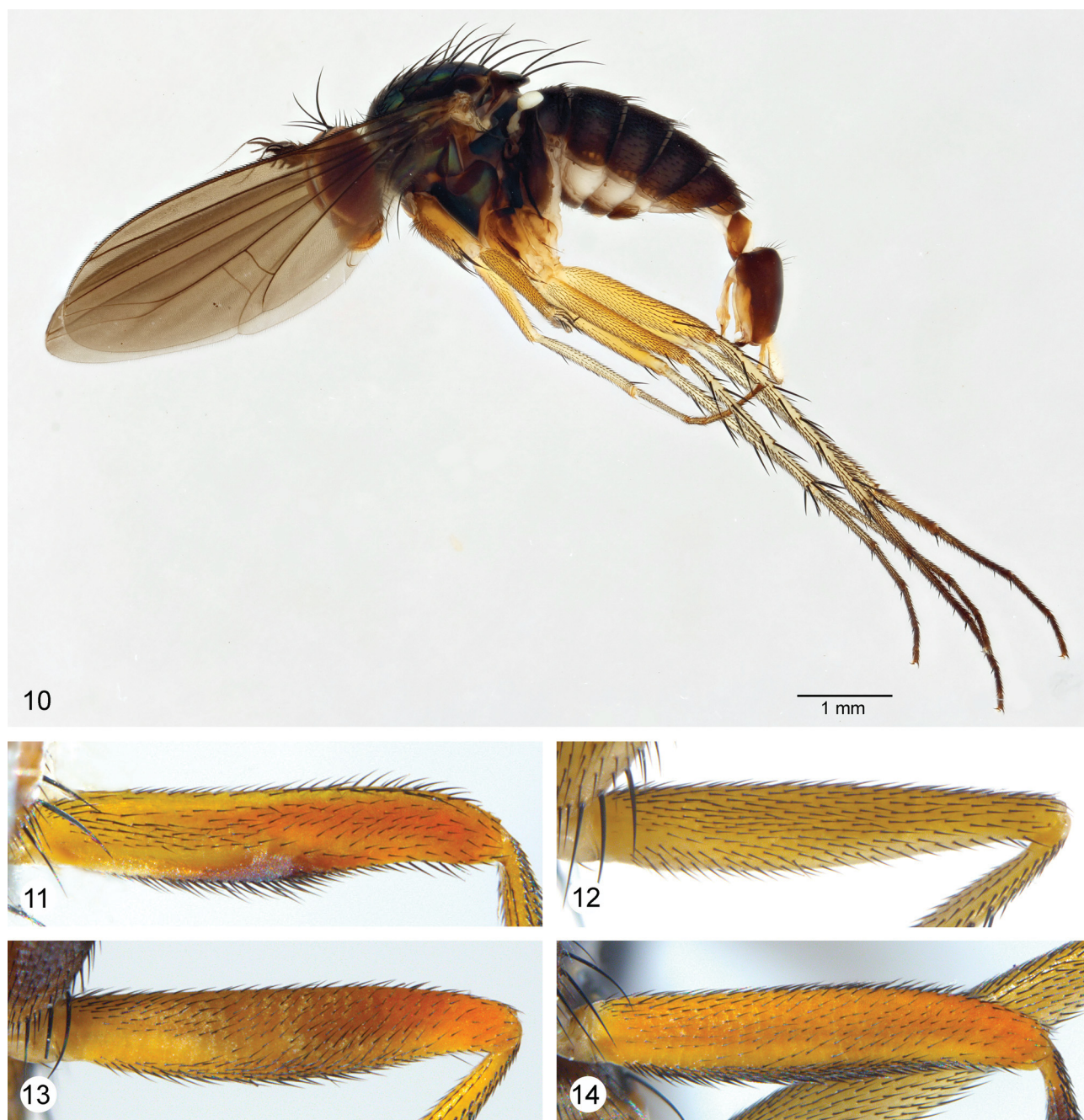
(Figs 3, 6, 7, 12, 20–22, 28–30)

Type material. HOLOTYPE: ♂, from Parque Nacional Chapada das Mesas, Brazil (Maranhão), labelled: “CZMA| Brasil, (MA), Carolina| PARNA Chapada das Mesas,| Riacho Sucuruíu, 240 m| 07°07'05.6"S/47°18'32"W”; “CZMA| Armadilha de Malaise| 20–30.ix.2014, J.A. Rafael,| F. Limeira-de-Oliveira, T.L.| Rocha & G.A. Reis, cols.”; “HOLOTYPE/ *Cheiromyia nordestina* Limeira-de-Oliveira & Cumming” [red label] (CZMA).

PARATYPES: BRAZIL: Ceará: Ubajara, Parque Nacional de Ubajara, Cachoeira do Cafundó, 3°50'13"S, 40°54'35"W, Armadilha Suspensa, 18–30.xi.2012, F. Limeira-de-Oliveira, J.S. Pinto Júnior (1♂, CZMA); same data except, 1–15.i.2013 (1♂, CNC); same data except, 1–14.ii.2013, J.A. Rafael, F. Limeira-de-Oliveira (1♂, CZMA); same data except, 15–28.ii.2013 (2♂, CZMA; 2♂, INPA; 2♂, CNC); same data except, Malaise, 1–15.xii.2012 (2♂, CZMA); same data except, 16–31.i.2013 (2♂, CZMA; 1♂, INPA; 1♂, CNC); same data except, 1–14.ii.2013, J.A. Rafael, F. Limeira-de-Oliveira (1♂, CZMA; 1♂, INPA; 1♂, CNC); same data except, 15–28.ii.2013 (3♂, CZMA; 3♂, INPA; 3♂, CNC). **Piauí:** Guaribas, Parque Nacional Serra das Confusões, Andorinha, 515 m, 9°8'28"S, 43°33'42"W, Malaise, 1–10.v.2014, J.A. Rafael, F. Limeira-de-Oliveira, T.L. Rocha & G.A. Reis (1♂, CZMA; 1♂, INPA; 1♂, CNC); same data except, 10–20.ix.2014 (1♂, CZMA); Piracuruca, Parque Nacional de Sete Cidades, Posto do ICMBio, 4°5'57"S, 41°42'34"W, Malaise, 12–27.iii.2013, F. Limeira-de-Oliveira, T.T.A. Silva (1♂, CZMA); same data except, 19–24.iv.2012, J.A. Rafael, F. Limeira-de-Oliveira (1♂, CZMA); same data except, Armadilha Suspensa, 16–31.i.2013, F. Limeira-de-Oliveira, J.S. Pinto Júnior (3♂, CZMA; 1♂, INPA; 1♂, CNC); same data except, 19–24.iv.2012, J.A. Rafael, F. Limeira-de-Oliveira (1♂, CZMA). **São Paulo:** Getulina, 21°49'12"S, 50°3'44"W, sweeping on moist soil, 22.i.2017, R.S. Capellari (2♂, IFTM)

Recognition (male). This species can be distinguished based on the following combination of characters: postpedicel about 3.5X as long as wide, elongate subtriangular, gradually tapering to apex, outer surface with 5–6

short stubby projections, with dorsal margin infusate (Figs 3, 6, 7); face relatively broad (Fig. 3); fore femur pale yellow, not laterally compressed, without dense setulae along anteroventral margin (Fig. 12); apicoventral epandrial lobe projecting ventrally with narrow pointed apex (Fig. 22); hypandrium nearly symmetrical (Fig. 21); cercus pale, not extensively infusate on ventral (inner) surface (Fig. 20). This species is morphologically very similar to *C. carolina* Limeira-de-Oliveira & Brooks **sp. nov.** and *C. pennaticornis*, but can be distinguished by the postpedicel with short stubby projections and by the pale yellow fore femur that lacks dense setulae anteroventrally.



FIGURES 10–14. Habitus of *Cheiromyia fuscipennis* Pollet & Brooks **sp. nov.** and fore femora of male *Cheiromyia* species in anterior view. **10.** *Cheiromyia fuscipennis* Pollet & Brooks **sp. nov.**, holotype male (submerged in ethanol). **11.** *Cheiromyia carolina* Limeira-de-Oliveira & Brooks **sp. nov.** **12.** *Cheiromyia nordestina* Limeira-de-Oliveira & Cumming **sp. nov.** **13–14.** *Cheiromyia pennaticornis* (Parent), fore femora of two specimens from the Mitaraka Mountains, French Guiana, taken during same collection event (i.e., sample MITARAKA/025, see list of specimens examined).

Description (male). Body length: 5.6–6.8 mm, wing length: 4.2–4.9 mm. **Head:** Eyes uniformly dull red. Upper-most 6–7 postocular setae black, lower 11–13 white, lower-most seta dark brown. Frons subrectangular

(wider than high), dark metallic blue-green with violet reflections, silvery white pruinosity on lateral margins. Face (Fig. 3) opaque yellow-brown with silvery white pruinosity on upper and lateral parts, relatively broad. Clypeus subrectangular (wider than high), concolorous with face, more than 1/4 face height. Palpus yellowish brown, ovoid with short black setulae on apical half of outer surface. Proboscis mainly yellowish, anterior surface of each labellar lobe dark brown with close-set row of 2 elongate thickened black setae with apical third abruptly downturned or curled, each labellar lobe with long thin brown seta preapically and near middle. Antenna (Figs 3, 6, 7) with scape and pedicel pale yellow below and infusate yellowish brown dorsally, postpedicel pale basally with dark apicodorsal margin and apex, inner surface with distinct whitish pruinosity; scape obconical, with acute ventral process; pedicel short; postpedicel about 3.5X as long as wide, elongate subtriangular, gradually tapering to apex, outer surface with 5–6 short stubby projections (occasionally bifurcated), arista-like stylus dorsal, well before middle of dorsal margin of postpedicel, basal article elongate nearly extending to tip of postpedicel, distal article with long pubescence. **Thorax:** Scutum metallic blue-green with violet reflections, bronze area above notopleuron (postsutural). Scutellum metallic blue-green with violet reflections. Mesopleuron gray pruinose with dark blue-green background coloration, with metallic reflections. **Legs:** Mainly pale yellow with black setae, except as noted below. *Fore leg:* Femur not laterally compressed, without dense setulae along anteroventral margin (Fig. 12); tibia not swollen; tarsomeres 3–5 with sparse velvety pile on ventral surface, claws slightly enlarged (relative to other legs). *Mid leg:* Coxa with lateral surface brown with silvery pruinosity, mainly pale apically; tarsus infusate from tarsomere 2 onwards. *Hind leg:* Tarsus infusate from tarsomere 2 onwards. **Wing:** With slight brownish tint; M with weak arc beyond bend. **Abdomen:** Tergites 1–5 dark metallic green, with silvery pruinosity laterally. *Hypopygium* (Figs 20–22): Epandrium dark brown, with apicoventral 1/3 pale; left basiventral epandrial lobe short and rounded with basiventral epandrial seta on ventral medial surface, right basiventral lobe forming dentiform projection immediately distal to basiventral epandrial seta; apicoventral epandrial lobe projecting ventrally with narrow pointed apex, bearing 2 long lateral setae, medial surface of lobe forming weakly sclerotized rounded process (left and right apicoventral epandrial lobes largely symmetrical). Surstylus: dorsal arm with broad medioventral lobe, with long finger-like dorsal process bearing long apical seta, apex broadly expanded with microtrichia ventrally; ventral arm with sinuous apical seta, apex rounded, with subapical process present. Postgonite digitiform, slightly curved ventrally. Cercus subovoid, pale with dark outer margin, with sparse short pale setae dorsally and short erect pale setae along margin, with one longer pale seta apically. Hypandrium (Fig. 21) rounded apically, with small subapical dentiform process on each side, desclerotized medially. Sperm pump folded back on itself, with simple single fold, opposing surfaces tightly appressed. Phallus strongly widened preapically, with preapical flap-like dorsal process bearing lateral tooth on each side, apex narrow. Ejaculatory apodeme long with weak ventral curve. **Female:** Unknown.

Distribution. This species is widely distributed in northeastern Brazil and occurs in the gallery forests of the Cerrado and the Amazonian forest biomes of Chapada das Mesas National Park (Maranhão) (Fig. 28) and Sete Cidades National Park (Piauí), as well as in relict habitats of the Atlantic Forest in Serra das Confusões National Park (Piauí) (Fig. 29) and Ubajara National Park (Ceará) (Fig. 30). This species has also been collected from the southern Brazilian locality of Getulina, São Paulo.

Etymology. The specific epithet is based on the Portuguese word for northeastern, in reference to the northeastern distribution of this species within South America.

Remarks. This species appears closely related to both *C. pennaticornis* and *C. carolina* Limeira-de-Oliveira & Brooks **sp. nov.**, based primarily on a similar male postpedicel that is elongate subtriangular in shape and bears numerous projections along the outer surface.

New specimen records and information

Cheiromyia brevitarsis Brooks (Figs 1, 27–30)

Cheiromyia brevitarsis Brooks in Brooks *et al.*, 2010: 48.

New material examined. BRAZIL: Amazonas: Manaus, Campus Universitário, ICB [instituto de ciências biológicas], 16–23.vi.1988, M.C. Castilho, E. Bindá, Armadilha de Shannon, feces (1♂, INPA). **Ceará:** Ubajara,

Parque Nacional de Ubajara, Cachoeira do Cafundó, 3°50'13"S, 40°54'35"W, Malaise, 13–17.xi.2012, F. Limeira-de-Oliveira, D.W.A. Marques (1♂, CZMA); same data except, 18–30.xi.2012 (1♂, CZMA; 1♂, INPA); same data except, 1–15.xii.2012, F. Limeira-de-Oliveira, J.S. Pinto Júnior (1♂, CZMA; 1♂, INPA; 1♂, CNC); same data except, 16–31.xii.2012 (2♂, CZMA; 1♂, INPA); same data except, 16–31.i.2013, F. Limeira-de-Oliveira, J.S. Pinto Júnior (1♂, CZMA; 1♂, INPA; 1♂, CNC); same data except, 1–14.ii.2013, J.A. Rafael, F. Limeira-de-Oliveira (1♂, CZMA; 2♂, INPA); same data except, 5–22.iii.2013, F. Limeira-de-Oliveira, T.T.A. Silva (1♂, CZMA; 1♂, INPA; 1♂, CNC); same data except, Armadilha Suspensa, 18–30.xi.2012, F. Limeira-de-Oliveira, J.S. Pinto Júnior (4♂, CZMA; 2♂, INPA; 2♂, CNC); same data except, 16–31.xii.2012 (1♂, CZMA); same data except, 1–15.i.2013, F. Limeira-de-Oliveira, J.S. Pinto Júnior (1♂, CZMA); same data except, 1–14.ii.2013, J.A. Rafael, F. Limeira-de-Oliveira (1♂, CZMA); same data except, 15–28.ii.2013 (1♂, CZMA); same data except, Varredura, 20–22.vii.2012, J.A. Rafael, F. Limeira-de-Oliveira (3♂, CZMA; 3♂, INPA; 1♂, CNC). **Maranhão:** Alto Parnaíba, Balneário Brejo do Campo, 9°5'41"S, 45°57'0"W, Varredura, 13–15.x.2004, F. Limeira-de-Oliveira (1♂, CZMA; 1♂, INPA; 1♂, CNC); Caxias, Reserva Ecológica do Inhamum, 4°54'11"S, 43°26'19"W, Varredura, 9.ix.2004, F. Limeira-de-Oliveira, J.T. Câmara (1♂, CZMA); same data except, 10.ix.2004, F. Limeira-de-Oliveira, J.T. Câmara & J.O.A. Silva (1♂, CZMA); same data except, 28.vi.2005, F. Limeira-de-Oliveira (2♂, CZMA); same data except, Malaise, 30–31.vii.2015, F. Limeira-de-Oliveira, D.M. Limeira, A.K.C. Fernandes & M.J. Rodrigues (1♂, CZMA; 1♂, INPA; 1♂, CNC); same data except, Varredura (1♂, CZMA; 1♂, CNC); Carolina, PARNA[=Parque Nacional] Chapada das Mesas, Riacho Cancela, 225 m, 7°6'44"S, 47°17'57"W, Malaise, 7–15.vi.2013, J.A. Rafael, F. Limeira-de-Oliveira & T.T.A. Silva (1♂, CZMA; 1♂, INPA); same data except, 11–14.vi.2013, J.A. Rafael, F. Limeira-de-Oliveira, J.T. Câmara & A.A. Santos (1♂, CZMA); same data except, 1–15.vii.2013, J.A. Rafael, F. Limeira-de-Oliveira, T.T.A. Silva (1♂, CZMA; 1♂, CNC); same data except, 15–31.vii.2013 (1♂, CZMA); same data except, 1–10.viii.2013 (1♂, CZMA); same data except, 20–31.viii.2013 (1♂, CZMA); same data except, 1–10.ix.2013 (1♂, CNC); same data except, 10–20.ix.2013 (1♂, INPA); same data except, 1–10.xii.2013 (1♂, CZMA); same data except, 10–20.ix.2014, J.A. Rafael, F. Limeira-de-Oliveira, T.L. Rocha & G.A. Reis (1♂, CZMA); same data except, Varredura, 11–14.vi.2013, J.A. Rafael, F. Limeira-de-Oliveira, J.T. Câmara & A.A. Santos (1♂, CZMA); same data except, Armadilha Suspensa (5 m), 1–10.vi.2014, J.A. Rafael, F. Limeira-de-Oliveira, T.L. Rocha & G.A. Reis, Cols (1♂, CZMA); same data except, 20–30.vi.2014 (1♂, CZMA); PARNA Chapada das Mesas, Riacho Estiva, 265 m, 7°6'60"S, 47°21'21"W, Armadilha Suspensa dupla, 10–20.x.2013, J.A. Rafael, F. Limeira-de-Oliveira, T.T.A. Silva (1♂, CZMA); PARNA Chapada das Mesas, Riacho Sucuruí, 240 m, 7°7'6"S, 47°18'32"W, Malaise, 1–15.vii.2013, J.A. Rafael, F. Limeira-de-Oliveira, T.T.A. Silva (1♂, CZMA; 1♂, INPA; 1♂, CNC); same data except, 15–31.vii.2013 (1♂, CZMA); same data except, 1–10.viii.2013 (1♂, CZMA); same data except, 20–31.viii.2013 (1♂, CZMA); same data except, 10–20.xii.2013 (1♂, CZMA); same data except, 1–10.iv.2014, J.A. Rafael, F. Limeira-de-Oliveira, T.L. Rocha & G.A. Reis (1♂, CZMA; 1♂, INPA); same data except, 10–20.iv.2014 (2♂, CZMA); same data except, 20–30.iv.2014 (1♂, CZMA); same data except, 10–20.v.2014 (4♂, CZMA; 2♂, INPA; 2♂, CNC); same data except, 20–30.ix.2014 (5♂, CZMA; 2♂, INPA; 2♂, CNC); Centro Novo do Maranhão, REBIO-Reserva Biológica do Gurupi, 3°14'5"S, 46°41'83"W, Malaise, 7–15.i.2011, F. Limeira-de-Oliveira & D.W.A. Marques (1♂, CNC); Mirador, Parque Estadual do Mirador, Base dos Cágados, 6°48'29"S, 45°06'34"W, Malaise, 27.ix.–2.x.2011, F. Limeira-de-Oliveira & D.W.A. Marques (1♂, CZMA; 1♂, INPA; 1♂, CNC); same data except, Base da Geraldina, 6°37'25"S, 45°52'8"W, Malaise, 14–18.viii.2012, F. Limeira-de-Oliveira, J.S. Pinto Júnior & D.W.A. Marques (1♂, CZMA; 1♂, CNC); same data except, 13–19.x.2012, F. Limeira-de-Oliveira, L.L.M. Santos & L.S. Santos (1♂, CZMA; 1♂, INPA); same data except, 402 m, 6°35'58"S, 45°50'49"W, 2–12.viii.2013 (1♂, CZMA); same data except, 419 m, Armadilha Suspensa, 6°37'25"S, 45°52'08"W, 1–15.vi.2014 (1♂, CZMA; 1♂, CNC); same data except, Posto Avançado do Mel, 6°43'50"S, 44°58'59"W, Malaise, 2–8.iv.2011, F. Limeira-de-Oliveira & D.W.A. Marques (1♂, CZMA; 1♂, CNC); same data except, Riachão, Fazenda Altos, Varredura, 17–22.viii.2009, F. Limeira-de-Oliveira (1♂, CZMA). **Pará:** Obidos, Igarapé Curuçambá, 1°50'4"S, 55°29'26"W, 1–8.ix.2001, J.A. Rafael & J.F. Vidal (1♂, INPA). **Piauí:** Guaribas, Parque Nacional Serra das Confusões, Andorinha, 515 m, 9°8'28"S, 43°33'42"W, Malaise, 20–30.vi.2014, J.A. Rafael, F. Limeira-de-Oliveira, T.L. Rocha & G.A. Reis (1♂, CZMA; 1♂, INPA; 1♂, CNC); Piracuruca, Parque Nacional de Sete Cidades, Posto do ICMBio, 4°5'57"S, 41°42'34"W, Malaise, 19–24.iv.2012, J.A. Rafael, F. Limeira-de-Oliveira (1♂, CZMA; 1♂, CNC); same data except, 13–26.iv.2013, F. Limeira-de-Oliveira, T.T.A. Silva (1♂, CZMA; 1♂, INPA); same data except, 15–30.vi.2013, J.A. Rafael, F. Limeira-de-Oliveira, T.T.A. Silva, (1♂, CZMA; 1♂, INPA; 1♂, CNC); same data except, 1–6.vii.2013, J.A.

Rafael, F. Limeira-de-Oliveira, T.T.A. Silva, (1♂, CZMA); same data except, Armadilha Suspensa, 16–31.i.2013, F. Limeira-de-Oliveira, J.S. Pinto Júnior (2♂, CZMA); same data except, 15.vi.–3.vii.2013, J.A. Rafael, F. Limeira-de-Oliveira, T.T.A. Silva (1♂, CZMA); same data except, Varredura, 17–19.vii.2013, J.A. Rafael, F. Limeira-de-Oliveira (1♂, CZMA). **Tocantins:** Palmas, Loteamento Recanto da Ema, 10°4'9"S, 48°24'19"W, Malaise, 19–25.vi.2016, F. Limeira-de-Oliveira (1♂, CZMA). **FRENCH GUIANA:** Mitaraka, MIT-E-swamp, 2°13'51.9"N, 54°28'0.2"W, 445 m, on vegetation along small swamp, 7.iii.2015, SW, Marc Pollet (FR-GU/Mitaraka/2015), MITARAKA/085 (1♂, MAPC).

Distribution. *Cheiromyia brevitarsis* is known from northern South America, including Colombia, Guyana, French Guiana and Brazil (Amapá, Amazonas, Maranhão, Pará, Roraima, plus the new records from Ceará, Piauí, Pernambuco, Sergipe and Tocantins listed above). Although now the most abundantly collected species in the genus (over 150 specimens listed here and in Brooks *et al.* 2010), of the 37 sites investigated in the intensive survey of the Mitaraka Mountains of French Guiana, only a single male of this species was taken in a swampy forest near the Sommet-en-Cloche inselberg (Fig. 27) (Pollet *et al.* 2018). Figures 28–30 show collecting localities in the Brazilian National Parks of Chapada das Mesas (Maranhão), Serra das Confusões (Piauí) and Ubajara (Ceará) where specimens of *C. brevitarsis* were collected along with specimens of *C. carolina* Limeira-de-Oliveira & Brooks **sp. nov.** and *C. nordestina* Limeira-de-Oliveira & Cumming **sp. nov.**

Cheiromyia palmaticornis (Parent)

Cheirocerus palmaticornis Parent, 1930: 13.

Cheiromyia palmaticornis (Parent): Dyte 1980: 223.

Cheiromyia palmaticornis (Parent): Brooks *et al.* 2010: 52 (redescription).

New material examined. BRAZIL: Amazonas: Manaus, Res. Ducke Igarapé Tinga Malaise 1, 12–22.vii.2004, A. Henriques (2♂, INPA).

Distribution. *Cheiromyia palmaticornis* is known from eastern Ecuador, Surinam, French Guiana and Brazil (Amapá, Pará, plus the new record from Amazonas above).

Cheiromyia pennaticornis (Parent)

(Figs 9, 13, 14, 23, 24, 26)

Cheirocerus pennaticornis Parent, 1931: 11.

Cheiromyia pennaticornis (Parent): Dyte 1980: 223.

Cheiromyia pennaticornis (Parent): Brooks *et al.* 2010: 54 (redescription).

New material examined. BRAZIL: Amazonas: Manaus, Res. Ducke, Igarapé Barro Branco, 2°55'52"S, 59°58'30"W, 17.vi.2015, J.M. Cumming, J.A. Rafael, D.A.W. Marques & S. Cumming, sweep (1♂, INPA; 1♂, CNC). **Minas Gerais:** Uberaba, IFTM [Instituto Federal do Triângulo Mineiro], 19°39'55"S, 47°57'29"W, yellow pan trap on moist soil, 1–8.xi.2017, R.S. Capellari (1♂, IFTM). **FRENCH GUIANA:** Mitaraka Mountains: MIT-A-RBF1, 2°14'11.4"N, 54°27'07.0"W, 306 m, on vegetation along muddy trail and in swamp, 6.iii.2015, SW, MITARAKA/074, M. Pollet (1♀, MAPC); MIT-A-RBF2, 2°14'12.5"N, 54°27'8.1"W, 287 m, on bamboo and banana-like leaves, 27.ii.2015, SW, MITARAKA/020, M. Pollet (1♀, MAPC); same data except, 2.iii.2015, SW, MITARAKA/044 (3♀, MAPC); MIT-C-RBF1, 2°14'10.8"N, 54°26'49.5"W, 258 m, on vegetation along and in creek, 2.iii.2015, SW, MITARAKA/045, M. Pollet (5♂, 3♀, MAPC); same data except, 27.ii.2015, SW, MITARAKA/017 (7♀, MAPC); same data except, 28.ii.2015, SW, MITARAKA/025 (3♂, 3♀, CNC; 1♂, 4♀, MNHN); same data except, 3.iii.2015, SW, MITARAKA/057 (5♀, MAPC); same data except, 4.iii.2015, SW, MITARAKA/061 (3♂, 2♀, MAPC); same data except, 4.iii.2015, SW, MITARAKA/062 (3♂, 2♀, MAPC); same data except, 6.iii.2015, SW, MITARAKA/077 (2♂, MAPC); same data except, 8.iii.2015, SW, MITARAKA/087 (1♂, MAPC); same data except, tropical wet forest (bas fond), 24–27.ii.2015, YPT, MITARAKA/122 (1♂, MAPC); same data except, 24–27.ii.2015, YPT, MITARAKA/122 (1♀, MAPC); MIT-C-RBF2, 2°14'3.4"N, 54°26'53.0"W, 299 m, on vegetation along muddy trail and in swamp, 3.iii.2015, SW, MITARAKA/056 (1♂, MAPC); same data except, 4.iii.2015, SW, MITARAKA/064 (2♂, MAPC); same data except, 6.iii.2015, SW,

MITARAKA/072 (1♂, MAPC); same data except, 27.ii.2015, SW, MITARAKA/018 (2♀, MAPC); same data except, tropical wet forest (bas fond), 27.ii.–6.iii.2015, YPT, MITARAKA/125 (1♂, 1♀, MAPC); same data except, 6–10.iii.2015, YPT, MITARAKA/136 (2♂, 2♀, MAPC); MIT-DZ-RBF2, 2°13'59.3"N, 54°27'0.3"W, 283 m, on vegetation along stream and in swamp, 28.ii.2015, SW, MITARAKA/026, M. Pollet (1♂, 1♀, MAPC).

Description (female). Similar to male (see Brooks *et al.* 2010 for description of male), except as follows: Body length: 5.8–6.5 mm, wing length: 5.5–6.0 mm. Head as broad as high. Face slightly broader. Face and clypeus with silvery white pruinosity covering yellowish-brown ground color. Palpus with sparser short, inclined setulae, and one strong black apical seta. Proboscis lacking close-set row of long curly hairs on anterior surface of each labellar lobe. Antenna (Fig. 9) unmodified, postpedicel small, lacking projections, subtriangular with acute apex, 1.4X as long as wide, pale reddish yellow with dark margin; arista-like stylus with basal article about 1/8 as long as apical article. Fore leg with coxa pale on anterior surface; tibia pale; femur pale yellow, with setulae of anteroventral edge not distinctly denser; tarsus without velvety pile ventrally; claws unmodified. Mid leg with tibia pale. Hind leg with tibia pale. Terminalia with tergite 10 brown, divided medially into hemitergites each bearing 5 dark brown spines, spines blunt and somewhat flattened apically.

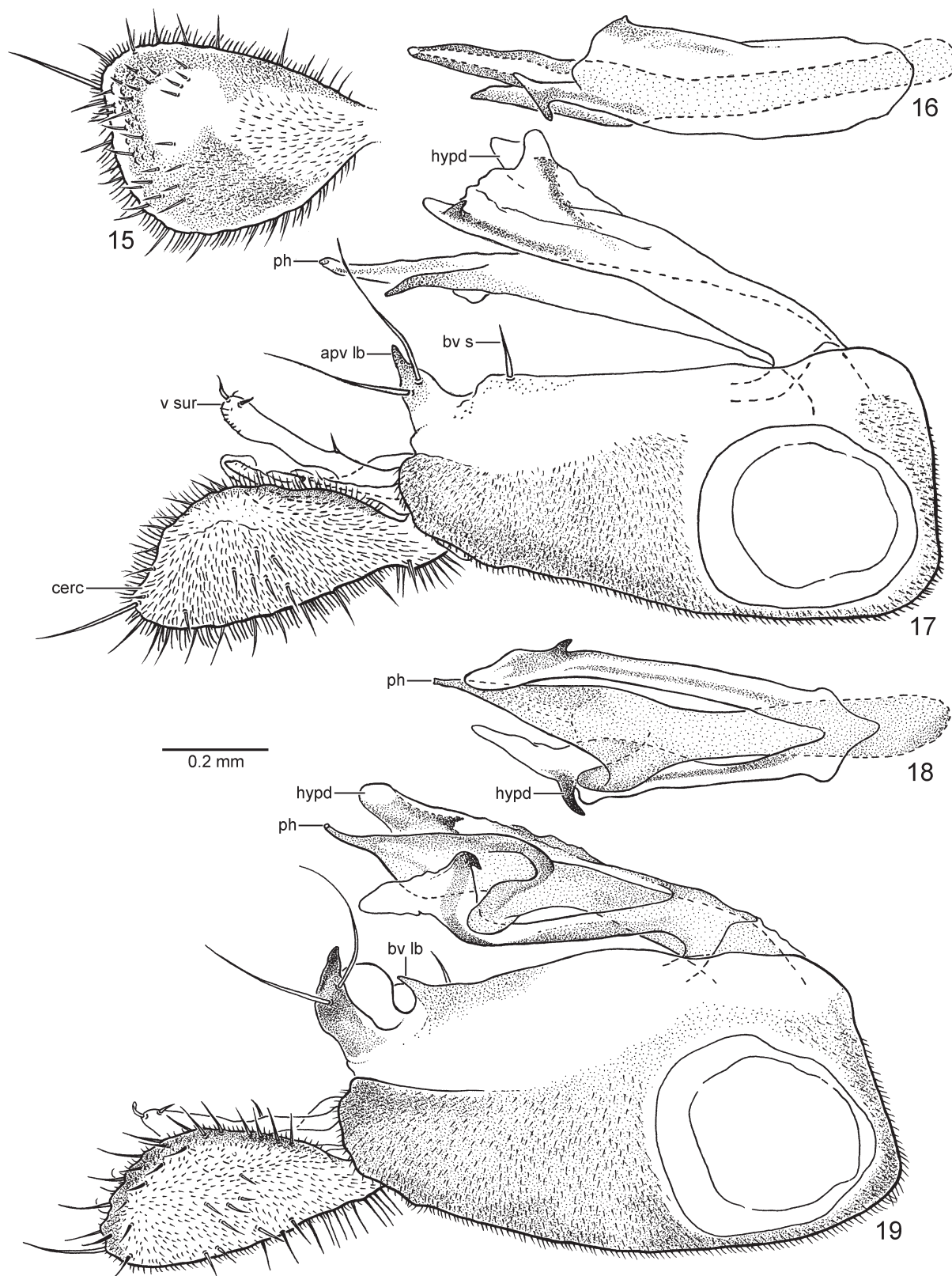
Distribution. *Cheimyia pennaticornis* was previously known from Bolivia (La Paz), Brazil (Acre, Amazonas, Pará) and is here newly recorded from southern Brazil (Uberaba, Minas Gerais) and from swampy forest habitats in the Mitaraka Mountains of French Guiana (Fig. 26).

Remarks. In addition to the characters mentioned in the description of *C. pennaticornis* provided by Brooks *et al.* 2010, males also have the fore femur somewhat laterally compressed with the anterior surface bright yellow-orange (Figs 13, 14), in contrast to the pale yellow femoral base color seen in most other species (Fig. 12), and the cercus extensively infusate on the ventral (inner) surface (Fig. 23). The fore femur (Fig. 11) and cercus (Fig. 15) of *C. carolina* Limeira-de-Oliveira & Brooks **sp. nov.** are similarly modified, suggesting a possible sister-group relationship between these species. Males of both species also possess dense setulae on the anteroventral margin of the fore femur (Figs 11, 13, 14), which in *C. carolina* are longer, more erect and restricted to the middle portion (Fig. 11). In *C. pennaticornis* these setulae are shorter, more appressed and run along most of the anteroventral edge of the fore femur but vary considerably in density among specimens (Figs 13, 14). Males of *C. pennaticornis* also exhibit variation in the coloration of the tibiae, which range from entirely pale yellow to almost entirely infusate. Further variation in *C. pennaticornis* is observed in the basiventral lobe of the hypopygium, which may be well-developed as in the holotype (Brooks *et al.* 2010, fig. 7), or reduced with a medial dentiform process immediately distal to the basiventral seta (Fig. 24), as in males from Parque Nacional da Serra do Divisor, Acre, Brazil (see “Additional material examined” in Brooks *et al.* 2010, page 55).

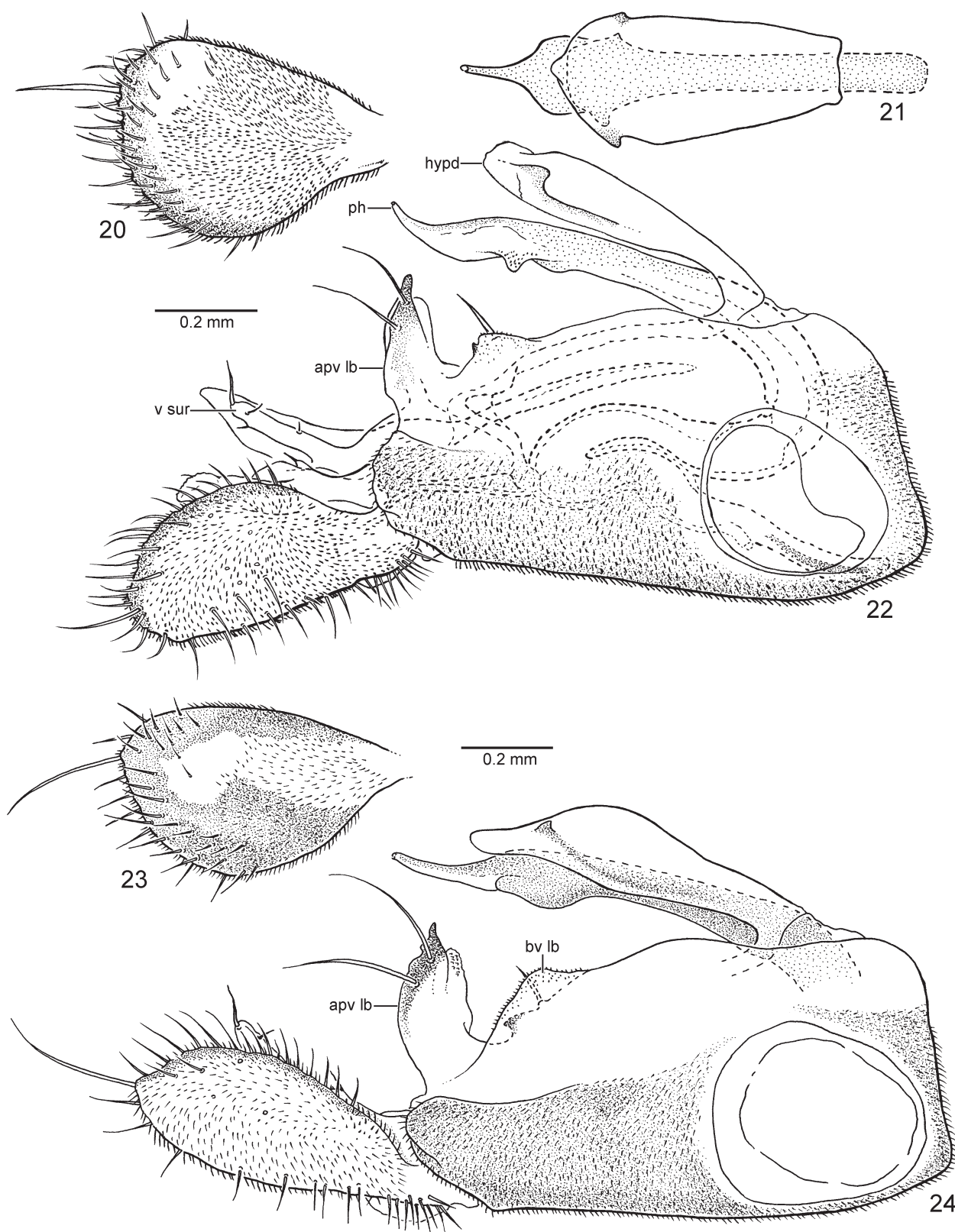
The recent “La Planète Revisitée” expedition to the Mitaraka Mountains of French Guiana in 2015 (Pascal *et al.* 2015; Pollet *et al.* 2015, 2018) yielded a large series of *C. pennaticornis* (65 specimens), including the first-known associated female specimens (see description above). Specimens of *C. pennaticornis* were collected in both non-flooded and flooded palm swamps, with darker flooded sites preferred (Fig. 26). Most specimens were collected through visual searches and by sweep netting with only 8 additional specimens captured in yellow pan traps (Pollet *et al.* 2018).

Discussion

Cheimyia is known from Central America and the northern half of South America and has not been recorded from the Pacific side of the Andes Mountains. The genus appears to be confined to both low and mid elevation rainforests (800 m or less), including gallery forests. Eight species have now been described with some known from only a few specimens (i.e., *C. bicornis*, *C. carolina* Limeira-de-Oliveira & Brooks **sp. nov.**, *C. fuscipennis* Pollet & Brooks **sp. nov.**, and *C. laselva*). Given the small number of specimens of *Cheimyia* in collections (< 300 specimens known), it is expected that further Neotropical collecting efforts will yield additional undescribed species. Only two species have been collected numerous times, with approximately 150 specimens known for *C. brevitarsis* and 70 specimens known for *C. pennaticornis*, including those specimens listed in Brooks *et al.* (2010). *Cheimyia pennaticornis* in particular, exhibits more intra-specific variation than the other known species in the genus. This might indicate that the concept of this species includes one or more currently unrecognized cryptic species. Collection of additional fresh specimens that are amenable for COI mitochondrial DNA analyses will allow testing of current species concepts and could assist in association of female specimens with conspecific males.



FIGURES 15–19. Hypopygia of *Cheiromyia*. **15.** *Cheiromyia carolina* Limeira-de-Oliveira & Brooks **sp. nov.**, left cercus, ventral view (inner surface). **16.** Same, hypandrium and phallus, ventral view. **17.** Same, hypopygium, left lateral view. **18.** *Cheiromyia fuscipennis* Pollet & Brooks **sp. nov.**, hypandrium and phallus, ventral view. **19.** Same, hypopygium, left lateral view. Abbreviations: apv lb–apicoventral epandrial lobe; bv lb–basiventral epandrial lobe; bv s–basiventral epandrial seta; cerc–cercus; hypd–hypandrium; ph–phallus; v sur–ventral lobe of surstylus.



FIGURES 20–24. Hypopygia of *Cheiromyia*. **20.** *Cheiromyia nordestina* Limeira-de-Oliveira & Cumming **sp. nov.**, left cercus, ventral view (inner surface). **21.** Same, hypandrium and phallus, ventral view. **22.** Same, hypopygium (internal detail shown), left lateral view. **23.** *Cheiromyia pennaticornis* (Parent), left cercus, ventral view (inner surface). **24.** Same, hypopygium, left lateral view. Abbreviations: apv lb–apicoventral epandrial lobe; bv lb–basiventral epandrial lobe; hypd–hypandrium; ph–phallus; v sur–ventral lobe of surstylus.



FIGURES 25–30. Collection localities and habitats of *Cheiromyia* species in the Mitaraka Mountains of French Guiana and Brazil. **25.** Type locality of *C. fuscipennis* Pollet & Brooks **sp. nov.** in a non-flooded palm swamp along the Alama River (Mitaraka, French Guiana). **26.** Collection locality of *C. pennaticornis* (Parent) in a flooded palm swamp (Mitaraka, French Guiana). **27.** Collection locality of *C. brevitaris* Brooks in a swamp near the Sommet-en-Cloche inselberg (Mitaraka, French Guiana). **28.** Type locality of *C. carolina* Limeira-de-Oliveira & Brooks **sp. nov.** and *C. nordestina* Limeira-de-Oliveira & Cumming **sp. nov.** in a gallery forest in buffer zone of Chapada das Mesas National Park (Maranhão, Brazil); specimens of *C. brevitaris* Brooks were also collected at this site. **29.** Collection locality of *C. nordestina* Limeira-de-Oliveira & Cumming **sp. nov.** and *C. brevitaris* Brooks in a relict of Atlantic Forest in Serra das Confusões National Park (Piauí, Brazil). **30.** Collection locality of *C. nordestina* Limeira-de-Oliveira & Cumming **sp. nov.** and *C. brevitaris* Brooks in a relict of Atlantic Forest, near Cafundó waterfall in Ubajara National Park (Ceará, Brazil).

Acknowledgements

Specimens from French Guiana examined in this study were collected by MP during his participation in the 2015 “La Planète Revisitée” expedition to the Mitaraka Mountains (also known as the “Mitaraka 2015 survey”) co-organized by the Muséum national d’Histoire naturelle in Paris (MNHN) and Pro-Natura International (www.laplaneterevisitee.org/en). This expedition was funded by the European Regional Development Fund (ERDF), the Conseil régional de Guyane, the Conseil général de Guyane, the Direction de l’Environnement, de l’Aménagement et du Logement and by the Ministère de l’Éducation nationale, de l’Enseignement supérieur et de la Recherche. It was a collaboration with the Parc amazonien de Guyane and the Société entomologique Antilles-Guyane (SEAG). MP was a member of the first expedition team (22 February–11 March 2015) and financially supported by the MNHN and Pro-Natura International. FLO thanks CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico) for financial support (grants PPBio - Rede Cerrado, proc. 457440/2012–0; Chamada 67/2013, proc. 406394/2013–0; Caatinga Project, proc. 551.991/2011–9 and Universal Project, proc. 472158/2012–0); and Fundação de Amparo à Pesquisa e Desenvolvimento Científico e Tecnológico do Maranhão (FAPEMA), for additional financial support (APP–00856/15; CBIOMA–03988/15). Thiara Lopes Rocha (CZMA) is gratefully acknowledged for her work in an unpublished thesis on the *Cheiromyia* of Maranhão, Piauí, Ceará and Tocantins (Rocha 2016). Thanks to José Rafael and Dayse Willkenia Marques (INPA) for hosting JMC during his visit to Manaus in June 2015 and taking him to Reserva Ducke to collect specimens of *Cheiromyia*. José Rafael and Renato Capellari are acknowledged for providing label data for some specimens housed in INPA and IFTM, respectively. Jessica Hsiung (CNC) skillfully illustrated Figure 1 and inked Figures 15–24. Renato Capellari (IFTM), Justin Runyon (U.S. Forest Service, Bozeman, Montana) and Brad Sinclair (CNC) provided helpful comments on the manuscript.

References

- Brooks, S.E., Cumming, J.M. & Pollet, M.A.A. (2010) Revision of the Neotropical genus *Cheiromyia* Dyte (Diptera: Dolichopodidae). *Zootaxa*, 2333, 41–58.
- Cumming, J.M. & Wood, D.M. (2017) [Chapter] 3. Adult morphology and terminology. In: Kirk-Spriggs, A.H. & Sinclair, B.J. (Eds.), *Manual of Afrotropical Diptera. Vol. 1. Introductory chapters and keys to Diptera families. Suricata 4*. South African National Biodiversity Institute, Pretoria, pp. 89–133.
- Dyte, C.E. (1980) Some replacement names in the Dolichopodidae (Diptera). *Entomologica Scandinavica*, 11, 223–224. <https://doi.org/10.1163/187631280X00545>
- Eigenmann, C.H. (1917) New and rare species of South American Siluridae in the Carnegie Museum. *Annals of the Carnegie Museum*, 11, 398–404.
- Parent, O. (1930) Ergebnisse einer zoologischen Sammelreise nach Brasilien, insbesondere in das Amazonasgebiet, ausgeführt von Dr. H. Zerny III. Teil. Diptera: Dolichopodidae. *Annalen des Naturhistorischen Museums in Wien*, 44, 5–26.
- Parent, O. (1931) Diptères dolichopodides de l’Amérique du Sud. Espèces nouvelles figurant dans la collection Schnuse conservées aux Staatliche Museen für Tierkunde und Völkerkunde zu Dresden. *Abhandlungen und Berichte der Museen für Tierkunde und Völkerkunde zu Dresden*, 18, 1–21, 3 pls.
- Pascal, O., Touroult, J. & Bouchet, P. (2015) *Expédition “La Planète Revisitée” Guyane 2014–2015. Synthèse des premiers résultats*. Muséum nationale d’Histoire naturelle, Pro-Natura International, Paris, 280 pp.
- Pollet, M., Leponce, M., Pascal, O., Touroult, J. & Van Calster, H. (2018) Dipterological survey in Mitaraka Massif (French Guiana) reveals megadiverse dolichopodid fauna with an unprecedented species richness in *Paraclius* (Diptera: Dolichopodidae). *Zoosystema*. [in press].
- Pollet, M., Touroult, J. & Pascal, O. (2015) Preliminary results of the Mitaraka expedition (French Guiana). *Fly Times*, 55, 3–10.
- Rocha, T.L. (2016) *Diversidade e taxonomia de Cheiromyia Dyte, 1980 (Diptera: Dolichopodidae) registrados nos estados do Maranhão, Piauí, Ceará e Tocantins, Brasil*. B.Sc. Thesis, Universidade Estadual do Maranhão, Caxias, 36 pp.